CLAIMS

What is claimed is:

1. A method of producing a three-dimensional composite support structure for supporting a body comprising the steps of:

a) providing a three-dimensional model of the body;

b) coupling a flexible pattern to a portion of the model;

c) covering the body model and flexible pattern with a deformable thermoplastic polymer layer;

d) applying one of pressure or vacuum to the thermoplastic polymer layer so as to cause an imprint of the flexible pattern to be formed into the polymer layer;

e) allowing the thermoplastic polymer layer to harden into a splash mold;

f) removing the splash mold from the body model and flexible pattern;

g) applying reinforced polymer into the imprint of the flexible pattern in the splash mold;

h) coupling the splash mold containing the pre-preg to the model of the body; and

i) applying one of pressure or vacuum to the model and the splash mold in the presence of heat so as to form the reinforced polymer material.

2. The method according to Claim 1 further including the step of coupling a breather layer over the body model.

3. The method according to Claim 1 wherein providing a body model is providing a cast model of the body.

4. The method according to Claim 1 further comprising the step of providing one of cutouts, landmarks and fixation points on the surface of the model.

5. The method according to Claim 1 wherein providing a model of a body is providing a model created utilizing a bio-scan system.

6. The method according to Claim 1 further including coupling metallic components to the reinforced polymer.

7. The method according to Claim 6 wherein coupling a metallic component is coupling a metallic component prior to forming of the reinforced polymer.

8. The method according to Claim 6 wherein applying reinforced polymer into the imprint is applying reinforced thermoset pre-preg into the imprint.

9. The method according to Claim 8 wherein the step of applying reinforced polymer material is applying reinforced thermoset pre-preg material having an alternating orientation.

10. The method according to Claim 1 further comprising the step of placing a deformable thermoplastic polymer spacer layer over a portion of the body model prior to the coupling of the flexible pattern.

11. The method according to Claim 1 further comprising the step of placing a breather material over the flexible pattern prior to covering the body model and flexible pattern with a deformable thermoplastic polymer layer.

12. The method according to Claim 1 further comprising the step of placing the splash mold including reinforced polymer into a vacuum bag and applying one of pressure or a vacuum to remove air from the reinforced material.

13. A method for producing a custom knee brace comprising the steps of:

a) providing a three-dimensional model of a knee;

b) coupling a flexible pattern corresponding to a portion of the knee brace to the surface of the knee model;

c) covering the knee model and flexible pattern with a deformable thermoplastic polymer layer;

d) applying one of pressure or a vacuum to the thermoplastic polymer layer so as to cause an imprint of the flexible pattern into the thermoplastic polymer layer;

e) allowing the thermoplastic polymer layer to harden into a splash mold;

f) removing the splash mold from the model of the knee;

g) applying reinforced thermoset polymer prepreg into the imprint of the flexible model of the splash mold;

h) coupling the splash mold to the model of the knee; and

i) applying one of pressure or vacuum to the splash mold in the presence of heat so as to cure the reinforced polymer material.

14. The method according to Claim 13 further comprising the step of coupling a metal hinge to the reinforced thermoset polymer pre-preg.

15. The method according to Claim 14 wherein coupling a metallic hinge to the reinforced thermoset polymer pre-preg is coupling a metallic hinge to the reinforced material prior to curing of the reinforced thermoset polymer pre-preg.

16. The method according to Claim 13 further comprising the steps of positioning at least one stockinet over the knee cast prior to the coupling of the flexible pattern.

17. The method according to Claim 13 further comprising the steps of coupling a polymer offset layer to the knee model prior to the coupling of the flexible pattern.

18. The method according to Claim 17 wherein the coupling of an offset layer is the coupling of a heated thermoplastic polymer layer by use of one of vacuum or pressure.

19. A die for a reinforced composite structure comprising:

a three-dimensional body model having a first die surface; and

a thermoplastic die having a second die surface, said first and second die surfaces defining a cavity configured to be a mold for thermoset polymers.

20. The die according to Claim 19 further comprising breather material disposed between the body and the thermoplastic die.

21. A method of producing a mold for reinforced thermoset materials comprising:

providing a mold base having a first die surface;

providing a flexible pattern over a portion of the first die surface;

providing a heated thermoplastic splash mold sheet over a portion of the first die surface and the flexible pattern;

applying one of pressure or vacuum to the heated thermoplastic sheet to cause it to deform over the flexible pattern thereby forming a cavity conforming to the shape of the flexible pattern; and

cooling the splash mold sheet to form a splash mold having a second to die surface conforming to the shape of the flexible pattern.

22. The method according to Claim 21 further comprising removing the flexible pattern from the mold base.

23. The method according to Claim 21 further comprising applying a breather layer between the flexible pattern and the first die surface.

24. The method according to Claim 21 wherein providing a mold base is providing a first die surface having a three-dimensional contour.

25. The method according to Claim 21 comprising placing a breathing layer between the flexible pattern and the heated thermoplastic sheet.